The Declining Role of Natural Gas Power in New England

A Comparison of Costs and Benefits

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Acadia Center
Advancing the Clean Energy Future

In Brief...

- Acadia Center examined two possible futures for the New England power grid: with, and without, additional natural gas supply and generation capacity.
- Over the next decade in New England, gas will play a much smaller role in electricity generation.
- As a result, existing gas-fired plants will be underused, and new plants, as well as new supply infrastructure like pipelines, will be unnecessary.

During the past twenty years, New England has become increasingly reliant on natural gas for meeting the region's power generation needs – to the point where gas now provides about 45% of the installed capacity on New England's grid. But the region cannot keep meeting energy needs with more natural gas – or "fossil gas" – a fossil fuel. Continuing to do so works against state climate policies, and every New England state has committed to reducing emissions of dangerous climate pollutants across its economy. These commitments include Massachusetts' target of reaching net-zero greenhouse gas (GHG) emissions by 2050, with other states setting their own reduction targets. In all states, renewable portfolio standards (RPSs) promote clean energy by providing incentives for renewable generators. Costs of renewable energy alternatives have dropped precipitously: the cost of electricity generated by wind has fallen 70% over the past ten years, outpaced only by utility-scale solar photovoltaic (PV) with nearly a 90% reduction in cost during the same period.[i] Meanwhile, recent cancellations of new gas infrastructure, including that of the Access Northeast pipeline, or the rejection by Rhode Island's siting board of a large gas-fired power plant, serve as testaments to what the future holds for fossil gas.

Unlike renewables, fossil gas requires a vast upstream network of extraction, production, and transmission to deliver fuel to power plants, and this network comes with several added risks. Pipelines and compressor stations are prone to leakage, sending methane – a particularly potent GHG – into the atmosphere. New England's reliance on imported gas also makes it susceptible to price fluctuations, which can be driven by factors well outside the region's control. Expenditures on fuel leave the region, rather than contributing to its economy. Perhaps most unfairly, communities living along the gas fuel chain continue to experience significantly worse air quality, leading to innumerable adverse health effects. Families living near fracked gas development sites in the US face an increased risk of cancer and other diseases[ii], and communities near gas power plants exhibit higher rates of asthma and pulmonary disease[iii]. Overwhelmingly, those impacted are from communities of color and are low-income[iv]. Despite such well-documented impacts, the problem of gas-driven air pollution in affected communities is getting worse[v]. Action to redress this long-known inequity is essential and must be prioritized throughout all levels of regional and state energy system decision-making.

Amid these trends, it is worth questioning whether continuing to invest in new gas infrastructure, such as power plants and pipelines that will last decades, best serves New England's energy, reliability, and climate needs – especially if there is a chance the infrastructure may only be used for a few years. Making the wrong choice now could lock the region into decades of expensive and carbon-intensive technologies.

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Two Alternatives

For this brief, Acadia Center examined the potential impacts of continuing to build generation powered by fossil gas and miles of gas pipeline, and the degree to which renewable alternatives could help New England reduce its climate footprint while bolstering its economy. To answer this question, Acadia Center modeled two different scenarios for the future of fossil gas in New England and compared their costs and benefits. The two scenarios for powering New England's electrical grid are labeled "Business-as-Usual" and "No New Gas", respectively. Acadia Center's model (designed using LEAP, or the Long-range Energy Alternatives Planning system[vi]) performs least-cost electricity production and capacity expansion calculations, alongside cost and GHG emissions accounting. It relies on a wide variety of publicly available data from ISO New England (ISO-NE), the Energy Information Administration (EIA), National Renewable Energy Laboratory (NREL), and others.[1]

Business-as-Usual	No New Gas
• All planned[2] power plants or other resources in the ISO-NE[3] region are completed on schedule. Additional power plants that are unplanned (fossil fuel-fired capacity, wind and solar including solar and battery hybrid systems, small hydro, waste-to-energy technologies and biomass) are added by the model when needed for system reliability and to meet load. • All planned fossil gas infrastructure (pipelines and compressor stations) investments are made, reducing the price of gas delivered to New England power generators.	• All planned power plants are completed on schedule, but after that, no additional unplanned fossil gas power plants are constructed. Other types of power plants are still built when needed. • None of the fossil gas infrastructure investments in Business-as-Usual are made, including for permitted projects.

Acadia Center examined each scenario through the year 2030, much of which is already planned through state policies and electricity market outcomes. For example, though market rules block many renewables from fully participating, ISO-NE has already awarded capacity obligations to many of the generators that will meet the grid's capacity needs through nearly the first half of the upcoming decade. Most state RPS goals extend to 2030 or beyond. Few significant plant retirements are planned in the next ten years, so requirements for new capacity are unlikely to change significantly under the electricity demand forecast that Acadia Center used for this study.[4] With so much predetermined and therefore included in both scenarios, there is only a narrow band of opportunity for the scenarios to diverge significantly before 2030.

[1] For more information on methods and data sources, see "The Declining Role of Natural Gas Power in New England: Detail and Technical Accompaniment".

[2] Planned capacity, in this brief, includes the results of ISO-NE's 14th Forward Capacity Auction, 2019 distributed solar forecast and all direct procurement (outside the ISO process) of resources by states.

[3] For brevity in this report, Acadia Center uses the term "New England" interchangeably with the ISO-NE control area, even though these areas do not completely overlap.

[4] Acadia Center choose a single energy demand forecast for both scenarios that includes modest expansion of transportation and building electrification, causing demand to rise slowly. The forecast is chosen to avoid underestimating the need for electricity, including electricity from fossil gas.

Findings

The Decline of Fossil Gas Electricity

Many New England states are directly procuring their own renewable energy resources, like Vineyard Wind near the coast of Massachusetts, or the Park City Wind project planned near Connecticut's shores. Using RPSs, states have set their own renewable energy requirements, many of which automatically ratchet up over time. Add to this substantial new electricity imports from Canada and other interties with New York[5], and the future for fossil gas power starts to look bleak. Acadia Center found that even under the conditions of the Business-as-Usual scenario, electricity produced by the region's fossil gas plants would meet just over 10% of the grid's annual energy needs in 2030, and even less (see Figure 1) in the No New Gas scenario. This is a bold departure compared to the nearly 40% of electricity that fossil gas provided in 2018.

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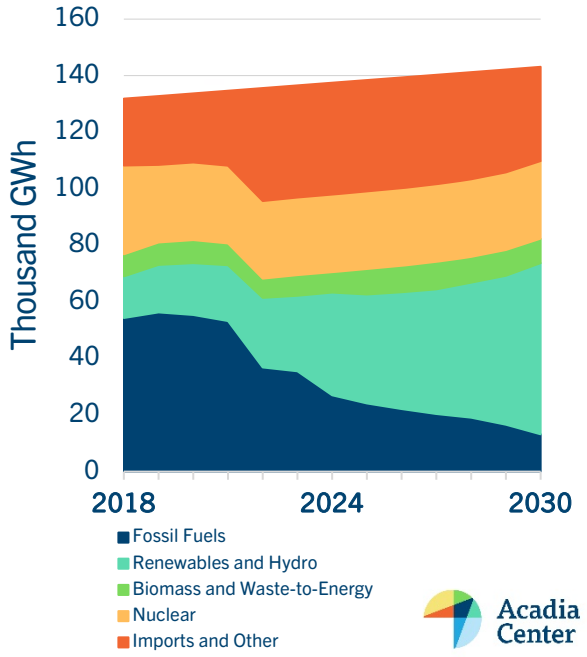
Figure 1: Electricity Production Shares by Resource in 2030, No New Gas Scenario

Category	Resource Type	Share of Energy	Change from Business-as-Usual†
Fossil Fuels		9.2%	-1.4%
	Fossil Gas	9.2%	-1.2%
	Other	0.1%	-0.2%
Renewable		42.3%	+3.6%
	Wind	27.3%	+2.5%
	Solar	10.1%	+0.8%
	Hydro	4.9 %	+0.3%
Biomass and Waste-to-Energy		6.0%	-1.1%
	Municipal Solid Waste	2.4%	-
	Biogas, Landfill Gas	3.3%	+1.1%
	Biomass	0.3%	-2.2%
Nuclear		19.2%	-
Other		23.4%	-1.1%
	Imports	23.2%	-0.9%
	Other	0.2%	-0.2%

Resource Mix for No New Gas Scenario



[5] Both scenarios include planned resources from ISO-NE's 14th Forward Capacity Auction (FCA) results. This choice is made for consistency, and does not imply endorsement of these resources by Acadia Center. Several new interties with New York and Canada were awarded supply obligations in the FCA, but some of these projects face legislative and political challenges, including a November 2020 ballot measure to reverse a Maine Public Utilities Commission order granting a certificate of public convenience and necessity to the New England Clean Energy Connect project.

†*Changes in this column represent the absolute change in the share of energy produced in the year 2030, between the No New Gas and Business-as-Usual scenarios. Numbers may not sum to 100% where expected, due to rounding.*

If fossil gas is only needed to meet a tenth of New England's energy needs, then planned fossil gas plants, and possibly existing ones, could have problems meeting their financial obligations. Even though these plants may still produce energy, they would do so at such a reduced level that operating some individual facilities may no longer be economic. With or without new gas-fired capacity, annual utilization rates (called *capacity factors*, which measure the amount of electricity produced relative to a plant's potential to produce electricity during the same period) averaged across the fleet of fossil gas plants would be less than 10% by 2030. Figure 2 clearly shows the impact of adding new import capacity with New York and Canada in 2022, followed by the growth in states' RPS programs thereafter.

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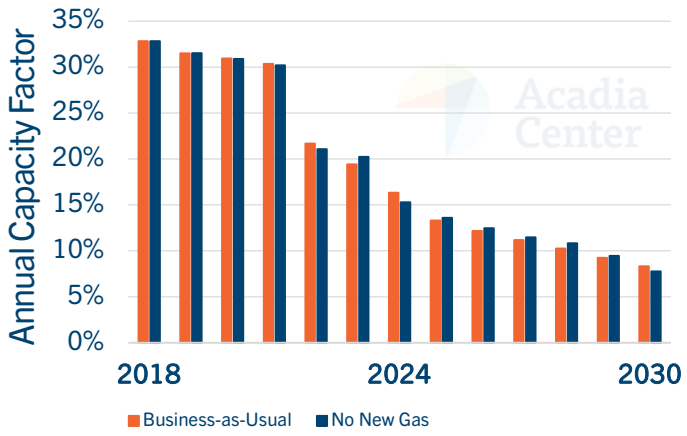
Figure 2: Annual Utilization of Fossil Gas Capacity



Together, Figure 1 and Figure 2 present a future that is vastly less reliant on fossil gas than today. This conclusion holds in both scenarios. Even the reduced fuel prices that arise from upgraded or expanded fossil gas infrastructure in the Business-as-Usual scenario are not enough to stabilize the decline in capacity factor, which is a strong argument against the need for those upgrades in the first place. Proceeding with new infrastructure that adds long-term cost while providing only short-term energy is economically unwise, and could potentially strand that infrastructure if it is unable to recover its costs.

Benefits of a Cleaner Grid for New England

Acadia Center's scenarios firmly suggest that fossil gas will play a smaller role in New England's electricity mix, whether large amounts of new fossil gas-fired capacity are built or not. To examine the benefits to the region of one pathway over another, Acadia Center calculated the net costs incurred in the No New Gas scenario compared to the Business-as-Usual scenario.

Figure 3: Discounted Net Costs of No New Gas vs. Business-as-Usual Scenario

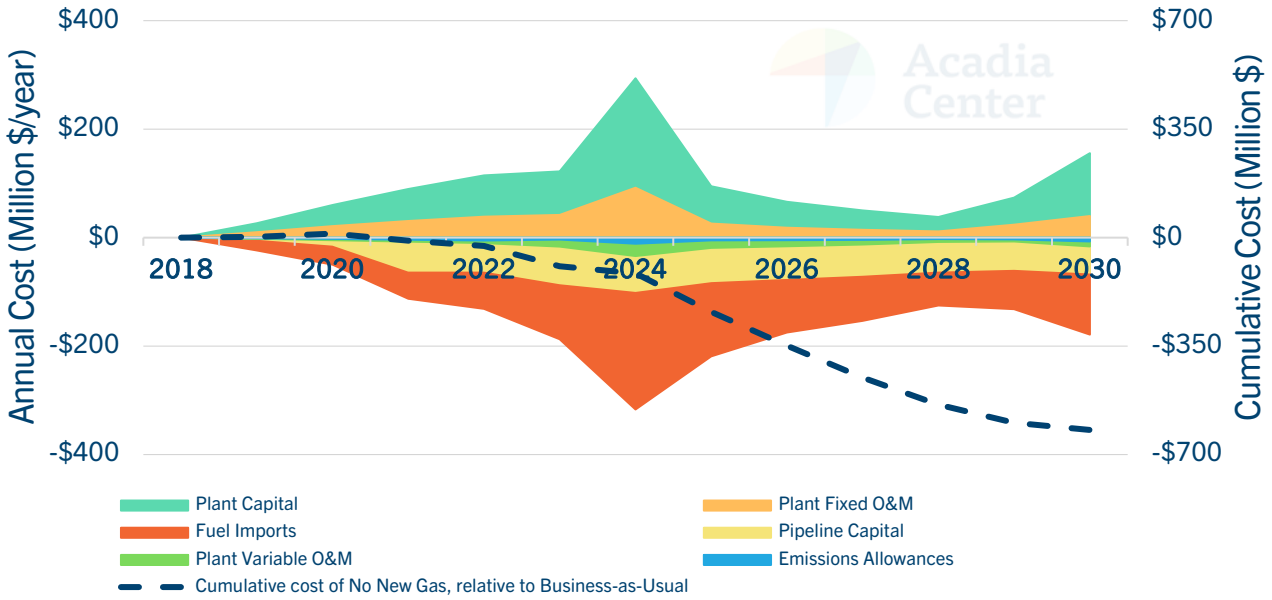


Figure 3 shows annual net costs of the No New Gas scenario for each major category, having subtracted the same cost from the Business-as-Usual scenario. Positive values for plant capital and fixed operation and maintenance (fixed O&M) indicate that these costs are higher in the No New Gas scenario compared to Business-as-Usual, reflecting the generally higher upfront and scheduled maintenance costs of renewables. Negative values for all other cost types indicate that these costs are lower in the No New Gas scenario. All cost differences are then summed together for the secondary axis (right side of chart, accompanied by dotted line), which shows the cumulative cost of No New Gas, compared to Business-as-Usual. This goes by another name, too: the net present value[6] of the No New Gas scenario, in each year through 2030. Figure 3 shows that when all of these net costs are added together, including the cost of constructing or upgrading fossil gas pipelines, and accounting for the cheaper fossil gas that these lines would deliver, the No New Gas scenario is no more expensive than Business-as-Usual. In fact, it shows that over the ten-year study period, the No New Gas scenario results in cumulative cost *savings* of about $620 million dollars, roughly enough to construct 500 MW of ground-mounted solar PV. **This finding certainly challenges the assertion that fossil gas is the most economic option, and illustrates the challenges facing New England's gas generators now and over the next ten years.**

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[6] To calculate present value, Acadia Center used a social discounting rate of 5% per year.

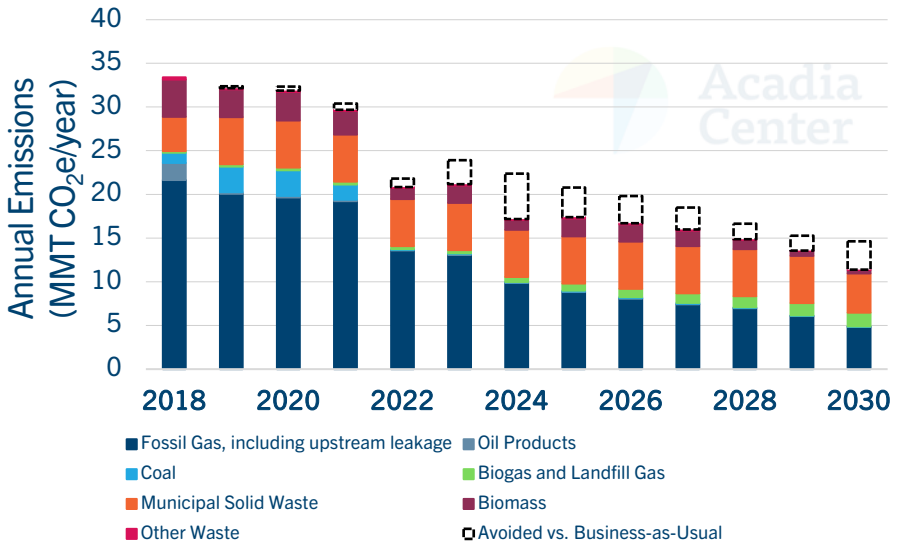
Moving beyond the savings presented above, shifting away from gas provides additional value in other ways. Since New England is not a producer of fossil fuels, most of the money spent on fuel leaves the region instead of staying put and being spent locally, adding jobs to the region's economy. For context, in 2017, spending on imported fossil gas for electricity amounted to nearly $1.4 billion across New England states[vii]. Instead, **under the No New Gas scenario, Acadia Center calculated that by 2030 the region would experience a net gain in employment** (see Figure 4). These employment benefits come from both direct jobs to build and operate power generators, and indirect jobs resulting from workers spending their wages in their communities.

Figure 4: Additional Job-Years in No New Gas vs. Business-as-Usual

State	Direct Job-Years	Indirect Job-Years
Connecticut	36	274
Massachusetts	2,035	2,638
Maine	558	1,632
New Hampshire	99	193
Rhode Island	841	1,164
Vermont	592	958
New England	**4,160**	**6,858**

Finally, savings in GHG emissions make the comparison even more favorable for the No New Gas scenario. Figure 5 shows emissions declining in either scenario and declining faster if no further fossil gas plants are added. In fact, over the coming decade, the No New Gas scenario avoids an accumulated 26 million metric tons (MMT) of CO_2-equivalent emissions that would otherwise be emitted under Business-as-Usual.

Figure 5: Greenhouse Gas Emissions in No New Gas Scenario



Recommended Actions and Implications

One thing is clear: in either of the scenarios that Acadia Center analyzed, the future of fossil gas power in New England will be a challenging one. Many decisions influencing what the grid will look like in the next ten years have already been made, which makes the remaining decisions even more important. Taking any missteps could potentially cost consumers money while locking in additional dangerous GHG emissions well beyond 2030. The results presented in this brief support four broad policy conclusions to help avoid those missteps:

1. Additional fossil gas generating capacity is unnecessary. Acadia Center's scenarios show that electricity produced from gas declines through 2030, and with it, the utilization of plants that have already been built or committed. Adding any new fossil gas capacity means that whatever room is left for gas-fired electricity remains would need to be shared among even more megawatts, and yet, those megawatts could add costs to the system. Beyond 2030 and the time horizon of this study, GHG mitigation will only become more imperative as states strive to meet increasingly steep emissions reduction mandates. Fossil gas plants built today will be all but squeezed out of this new reality, potentially rendering them unable to sell their electricity and stranding their costs. Construction of new fossil gas plants should be opposed under all circumstances, and when reviewing projects and issuing permits, states should critically assess the need for – and damage caused by – new fossil gas plants that are misaligned with their public policies.

2. Cheaper fossil gas, delivered by an upgraded and expanded network of pipelines, does not translate into system-wide cost savings using Acadia Center's model. Since New England has no need to add more fossil gas-fired generation capacity, it also has no need for new infrastructure to supply those plants with gas. Kinder Morgan's 261 Upgrade Project near Agawam, Massachusetts, Westbrook Xpress Phase 2 and Portland Xpress Phase 3, both near Westbrook, Maine, and Enbridge's Atlantic Bridge Phase 2 are projects that Acadia Center excludes in its No New Gas scenario, meaning that neither their investment costs nor gas price impacts would be incurred. In Massachusetts, the Weymouth compressor station recently had its air quality permit overturned in federal court. New fossil gas infrastructure like this is not needed now to meet the needs of New England's power sector, and it will not be needed in the future, even if Enbridge does manage to again secure the requisite permits.

3. Renewable electricity will play a huge role in helping states to meet their carbon reduction goals. Offshore wind is particularly important and finding ways to promote offshore wind project development and permitting will quickly pay clean energy dividends. Additionally, even though ISO-NE's own analyses confirm the many benefits of offshore wind, including its ability to reduce transmission congestion on the New England grid as well as reduce total production costs[viii], these benefits have not manifested in the rules that drive ISO-NE's markets. Wholesale markets must account for the benefits of renewables and not actively disadvantage them, as was seen during the last two forward capacity auctions. For example, only about 100 MW of Vineyard Wind's 800 MW capacity has been awarded a capacity supply obligation[ix], jeopardizing an important revenue stream for the project. States will continue to implement their clean energy policies using the tools at their disposal, and ISO-NE needs to recognize and value these state-procured resources. If ISO-NE's capacity markets continue to work against public policy goals, states should follow Connecticut's lead and hold the ISO accountable – or find ways to work around it.

4. The long-term impacts of climate change – on human and ecosystem health and on the economy – have a cost, too, and adding it onto the benefits of the No New Gas scenario would make an even clearer case against expanding fossil gas infrastructure. If the true cost of carbon pollution was reflected in

generators' price offers, or factored into decisions around which plants to construct in the first place, it is possible to imagine a future in which fossil gas would play an even smaller role than envisioned in this study. New England states participate in the Regional Greenhouse Gas Initiative (RGGI), which imposes a modest price on carbon emissions from power plants. The RGGI program should be strengthened by aligning the RGGI emissions cap with states' emissions goals, which would better reflect the cost of climate pollution while honoring state's climate policies.

New England's grid can have a bright future and the ball is already rolling towards clean energy, but there are plenty of opportunities to make mistakes along the way. Continuing to invest in fossil gas is one of those mistakes. Luckily, New England does not need to avoid further fossil gas development "at all costs", and instead the region can avoid these outcomes at *no cost*, incurring a small net savings alongside many other benefits. When shovels break ground for unneeded gas pipelines and power plants, those shovels dig the region deeper into a ditch from which it will be difficult to emerge.

For more information:

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For additional detail, refer to Acadia Center's "The Declining Role of Natural Gas Power in New England: Detail and Technical Accompaniment".

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